

Appl. No. 09/807,457
Amdt. dated April 7, 2004
Reply to Office Action of March 9, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) Method for the production of moulded bodies of a polyurethane material ~~where~~ comprising:

(a) preparing a mixture of starting components ~~is prepared which contains, on one hand comprising~~

(i) isocyanate and ~~on the other hand~~

(ii) unsaturated monomers ~~with~~ having both reactive double bonds and containing hydroxyl groups, ~~to an extent allowing for crosslinking of the starting components by a polyaddition reaction, and~~

~~where~~ wherein the monomers containing hydroxyl groups are used in a stoichiometric ratio or in less than the stoichiometric amount relative to isocyanate; ~~and~~

(b) subjecting the mixture ~~is subjected~~ to a polyaddition reaction that is not triggered by radicals ~~and that is~~ thereby generating a crosslinked, flexible, radical-polymerisable polyurethane preform having a content of nonextractable, reactive double bonds - as determined by DSC - of at least 0.5 mmole/g; ~~and~~

wherein said preform is free of extractable monomers with reactive double bonds;

wherein at least one of the starting components is at least trifunctional; ~~or polyfunctional~~
and

wherein the mixture before or during the polyaddition reaction is subjected to a shaping
step; and

(c) curing the resulting flexible preform ~~is cured~~ to a structurally rigid moulded body
by radical-triggered polymerisation of the reactive double bonds.

2. (Currently Amended) ~~Method according to~~ The method of claim 1; wherein the mixture
of starting components ~~contains~~ comprises (i) isocyanate and (ii) (meth)acrylate containing
hydroxyl groups in a ratio of about 1 : 1 between the OH and NCO groups.

3. (Currently Amended) ~~Method according to~~ The method of claim 1, ~~characterised in that~~
wherein the curing by radical-triggered polymerisation occurs without toxic emissions.

4. (Currently Amended) ~~Method according to~~ The method of claim 1, ~~characterised in that~~
wherein the preform is produced in the shape of a film, tape, ribbon, cord, or strand.

5. (Currently Amended) ~~Method according to~~ The method of claim 1, ~~characterised in that~~
wherein to the starting components at least one of the following components is added: a filler, a
fibre material, a coloured pigment.

6. (Currently Amended) ~~Method according to~~ The method of claim 1, ~~characterised in that~~ wherein curing of the preform occurs by radical polymerisation of the free double bonds while applying at least one measure selected from the group consisting of elevated pressure, elevated temperature, irradiation with microwaves, irradiation with blue light, irradiation with UV light, and ionizing radiation.

7. (Currently Amended) ~~Method according to~~ The method of claim 1, ~~characterised in that~~ wherein to the mixture of starting components at least one catalyst for triggering and/or accelerating a radical induced polymerisation of the reactive double bonds is added in an amount of up to 5 % by weight of the starting mixture.

8. (Currently Amended) ~~Method according to~~ The method of claim 1, ~~characterised in that~~ wherein two or more preforms, which are brought in mutual contact, are bonded together while applying elevated pressure and elevated temperature to yield composites or laminates and cured.

9. (Currently Amended) ~~Method according to~~ The method of claim 8, ~~characterised in that~~ wherein fibre material is inserted between the preforms prior to definite curing by radical polymerisation.

10. (Currently Amended) ~~Method according to~~ The method of claim 5, ~~characterised in that~~ wherein the filler is added in a concentration of at most 80 % by weight of the total weight of the polyurethane material.

11. (Currently Amended) ~~Method according to~~ The method of claim 5, ~~characterised in that~~ wherein the fibre material is present in the form of unidirectional fibre strands, woven or nonwoven fibre fabric.

12. (Original) ~~Method according to~~ The method of claim 11, ~~characterised in that~~ wherein the fibre material prior to the polyaddition reaction is impregnated with a mixture of the starting components, and then moulded in the form of plates or film and subjected to the polyaddition reaction.

13. (Currently Amended) ~~Method according to~~ The method of claim 6, ~~characterised in that~~ wherein the curing of the preform is carried out applying at least one condition or measure selected from the group consisting of a pressure of 2 to 10 bar, a temperature of 80 to 150°C, irradiation with light having a wavelength of 300 to 500 nm, and irradiation with microwaves having a wavelength of 1 to 1000 mm.

14 - 15. (Canceled)

16. (Currently Amended) ~~Moulded~~ The moulded body ~~according to~~ of claim ~~14~~ 51, characterised in that it is of a nature selected from the group consisting of colourless, translucent, air permeable, and foamed.

17. (Currently Amended) ~~Moulded~~ The moulded body ~~according to~~ of claim ~~14~~ 51, characterised in that it contains at least one additive selected from the group consisting of a filler, fibre material, and coloured pigment.

18. (Currently Amended) ~~Moulded~~ The moulded body ~~according to~~ of claim ~~14~~ 51, characterised in that it is present as a composite or laminate formed from at least two curable preforms.

19. (Canceled)

20. (Currently Amended) Method for the production of structurally rigid objects or formed parts made of a polyurethane material, comprising

~~(a) — providing a flexible preform having a crosslinked polyurethane matrix produced by a polyaddition reaction from isocyanate and monomers as starting components, which monomers have reactive double bonds and contain hydroxyl groups to an extent allowing for crosslinking of the starting components by polyaddition, at least one of the starting components being~~

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~~trifunctional or polyfunctional which preform has a content of nonextractable, reactive double bonds - as determined by DSC - of at least 0.5 mmole/g and is free of extractable monomers having reactive double bonds, and~~

~~—— (b)~~

(a) preparing a mixture of starting components comprising

(i) isocyanate and

(ii) unsaturated monomers having both reactive double bonds and hydroxyl groups,

wherein the monomers containing hydroxyl groups are used in a stoichiometric ratio or in less than the stoichiometric amount relative to isocyanate;

(b) subjecting the mixture to a polyaddition reaction that is not triggered by radicals thereby generating a crosslinked, flexible, radical-polymerisable polyurethane preform having a content of nonextractable, reactive double bonds - as determined by DSC - of at least 0.5 mmole/g;

wherein said preform is free of extractable monomers with reactive double bonds;

wherein at least one of the starting components is at least trifunctional; and

wherein the mixture before or during the polyaddition reaction is subjected to a shaping step; and

(c) curing the preform via radical polymerisation until a structurally rigid object or formed part is obtained.

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21. (Canceled)

22. (Currently Amended) ~~Method according to~~ The method of claim 20; wherein the structurally rigid objects or formed parts are selected from the group consisting of toys, utensils, art objects, decorative objects and elements for technical purposes in civil engineering and mechanical design comprising pipe connections, ways, borders, sheathing, mounting supports, sound, heat and electrical insulations, structural elements, components, casts of objects, moulds, optical wave guides, tool components, covers, and protective films.

23-24. (Canceled)

25. (Currently Amended) ~~Method according to~~ The method of claim 20; wherein the preform is elastic.

26. (Currently Amended) ~~Method according to~~ The method of claim 20; wherein the preform is foamed.

27. (Currently Amended) ~~Method according to~~ The method of claim 20; wherein the monomers comprise (meth)acrylate that contains hydroxyl groups.

28. (Currently Amended) ~~Method according to~~ The method of claim 20; wherein curing of the preform via radical polymerisation is accomplished during or after a further step of mechanical forming of the preform.

29. (Currently Amended) ~~Method according to~~ The method of claim 28; wherein said further step of mechanical forming of the preform is accomplished without removal of material.

30. (Currently Amended) ~~Method according to~~ The method of claim 28; wherein said further step of mechanical forming of the preform comprises at least one action selected from the group consisting of bending, twisting, pressing, rolling, and deep-drawing.

31. (Canceled)

32. (Previously Added) Method according to claim 1, wherein the mixture of starting components is flowable.

33. (Previously Added) Method according to claim 1, wherein the monomers with reactive double bonds comprise at least one compound selected from the group consisting of acrylate and methacrylate.

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34. (Previously Added) Method according to claim 1, wherein the shaping step comprises at least one method selected from the group consisting of casting, pressing, rolling, extruding, deep-drawing, and foaming.
35. (Previously Added) Method according to claim 1, wherein the flexible preform is elastic.
36. (Previously Added) Method according to claim 1, wherein the flexible preform is cured after a further forming step.
37. (Previously Added) Method according to claim 36, wherein the further forming step is accomplished without removal of material.
38. (Previously Added) Method according to claim 36, wherein the further forming step is selected from the group consisting of bending, twisting, pressing, rolling, deep-drawing, cutting, carving, grinding, and scraping.
39. (Canceled)

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40. (Previously Added) Method according to claim 7, wherein the catalyst is a hot-curing catalyst or a photocatalyst.

41. (Previously Added) Method according to claim 7, wherein the catalyst is added in an amount of 0.1 to 1% by weight.

42. (Previously Added) Method according to claim 8, wherein the preforms are in the form of films, tapes, ribbons, or plates.

43. (Previously Added) Method according to claim 8, wherein the preforms are piled up as layers or glued together with the aid of an adhesion promoter.

44. (Previously Added) Method according to claim 8, wherein the composites or laminates are cured with the aid of light.

45. (Previously Added) Method according to claim 9, wherein the fibre material is in the form of woven or nonwoven fibre fabric.

46. (Previously Added) Method according to claim 10, wherein the filler is added at a concentration of 20 to 75% by weight.

47. (Currently Amended) Method according to claim 5, wherein the fibre material is selected from the group consisting of glass fibres; and carbon fibres; ~~aramide fibres, cellulose fibres, and~~ polyethylene fibres.

48. (Currently Amended) Molded body according to claim ~~14~~ 51, wherein the monomers comprise (meth)acrylate containing hydroxyl groups.

49. (Currently Amended) Molded body according to claim ~~14~~ 51, wherein the polyurethane matrix contains additives.

50. (Currently Amended) Molded body according to claim ~~14~~ 51, which exhibits a surface treatment selected from the group consisting of ~~a coating~~, coloration, painting, and ~~texture~~ texturing.

51. (New) A moulded body comprising polyurethane material wherein said body is prepared by a process comprising:

(a) preparing a mixture of starting components comprising

(i) isocyanate and

(ii) unsaturated monomers having both reactive double bonds and hydroxyl

groups,

wherein the monomers containing hydroxyl groups are used in a stoichiometric ratio or in less than the stoichiometric amount relative to isocyanate;

(b) subjecting the mixture to a polyaddition reaction that is not triggered by radicals thereby generating a crosslinked, flexible, radical-polymerisable polyurethane preform having a content of nonextractable, reactive double bonds - as determined by DSC - of at least 0.5 mmole/g;

wherein said preform is free of extractable monomers with reactive double bonds;

wherein at least one of the starting components is at least trifunctional; and

wherein the mixture before or during the polyaddition reaction is subjected to a shaping step; and

(c) curing the resulting flexible preform to a structurally rigid moulded body by radical-triggered polymerisation of the reactive double bonds.